

Attached Appendix A

- **Host and Network Monitoring:**
 - Collection of Data via Operating System Calls for Minimal Intrusiveness
 - Common Data Formats Across Platforms
 - Distribution of Host and Network Statuses and Performance Histories
 - Discovery of Distributed Environment Configuration Changes
 - Detection of Host Failure
 - Detection of Host Startup
- **Application-Level Instrumentation:**
 - Low-Overhead Application API's
 - Common User-Specified Instrumentation Data Formats
 - Data Collection and Distribution Architecture
 - Grammar-Driven Event Correlation
- **System Specifications:**
 - Modeling of Application Systems
 - Structure, Capabilities, and Configuration
 - Requirements and Inter-Dependencies
 - Modeling of Hardware and Network Systems
 - Structure, Capabilities, and Configuration
 - Run-Time Access to Specification Information
 - Run-Time Loading of Specification Information
 - Run-Time Access via Object-Oriented API
- **Resource Allocation Decision-Making:**
 - Determination of Application-to-Host Mappings
 - Recovery from Hardware and Software Failures
 - Detection of and Recovery from Software Performance Problems
 - Control of Application Scalability
 - Reallocation of Applications to Hosts
 - Reallocation of Applications to Hosts based on Priority Changes
 - Application-to-Host Mappings for New Required Applications
 - Selection of Applications to be Shutdown
 - Resolution of Inter-Application Startup Dependencies
- **Resource Control:**
 - Startup, Shutdown, and Configuration of Distributed Applications
 - Interactive Operator Control via Operator Display
 - Creation of Defined System Configurations
 - Loading of Pre-defined System Configurations
 - Startup, Shutdown, and Configuration of Individual Applications
 - Automatic Control via Resource Manager Orders
 - Failure Detection Capabilities
 - Application Failure Detection via Interrupt Notification
 - Host Failure Detection via Internal Heartbeat Mechanism
- **Displays / Visualization:**
 - Host Configuration and Performance
 - Network Configuration and Performance
 - Application Software Performance
 - Resource Allocation Decisions and State Information
 - Software Status and Configuration
 - User-Configurable Instrumentation Display
 - Near Real-Time Display of Information
- **Middleware**
 - Reliable Message Passing
 - Location-Transparent TCP Client-Server Configuration
 - Automated Connections and Reconnections
 - Client and Server detection via UDP multicast
 - Many-to-Many Client-Server Connections supported
 - Message Callback Function Registration
 - TCP Connection Status Change Callback Function Registration

Attached Appendix B:

1) Event data message header:

```

long total_bytes
long message_type
char version[8]
char test_name[24]
double tag
unsigned int gm_time
unsigned int event_num
char process_name[24]
long pid
char host_name[64]
long ip_addr
long tid
unsigned int thread_type
unsigned int sequence_num
double time_in_client
double time_server_received
double time_server_sent

// total number of bytes in the event data message
// message type designator *
// version of Instrumentation APIs *
// test name for this event
// time stamp of when this event data message was sent
// GMT time stamp
// event number
// name of application sending event data message
// process id of application sending event data message
// host name that application is running on
// ip address of host
// task id of application sending event data message
// thread type
// sequence number of the event data message
// time the API was called to create event data message
// time the Instrumentation Daemon read in this event data message
// time the Instrumentation Daemon sent event data message to the Instrumentation Collector

```

%s : null-terminated string data
%C : character
%f : IEEE single precision floating point - signed 32 bit floating point
%i : signed 32 bit integer
%d : signed 32 bit integer
%u : unsigned 32 bit integer

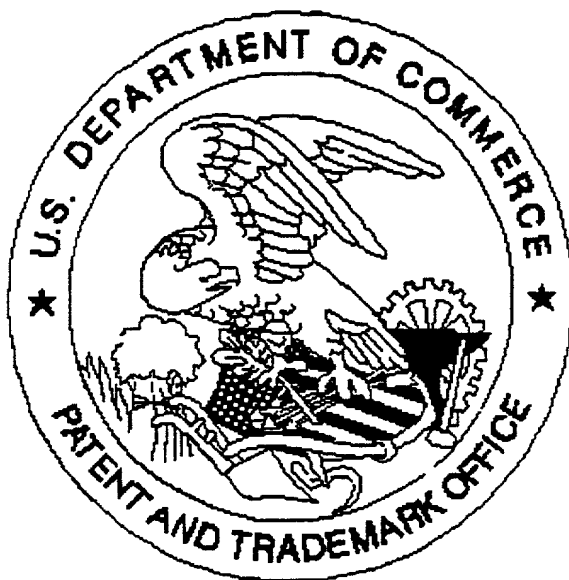
Event string example: "StartTime %.f StopTime %lf TrackNumber %u Hostname %s"

3) The data fields are then packed using the MessageBuffer class described in Appendix A of the RMComms Middleware Design Report.

Attached Appendix C

Class	Description
TCPCommClient	<p>RMComms client server communication client services:</p> <ul style="list-style-type: none"> ▪ client configuration <ul style="list-style-type: none"> - client name, server port number, network interface to use (optional) ▪ connection and disconnection to servers <ul style="list-style-type: none"> - all servers, specific servers, or servers on specific hosts ▪ sending user-defined messages to connected servers <ul style="list-style-type: none"> - send to all servers or only to specific servers ▪ receiving user-defined messages from connected servers <ul style="list-style-type: none"> - registration of message handler callback functions for specific messages - polled or asynchronous message delivery ▪ monitoring of server connection statuses <ul style="list-style-type: none"> - queries to determine connected server statuses - notification of new server connections or broken server connections
TCPCommServer	<p>RMComms client-server communication server services:</p> <ul style="list-style-type: none"> ▪ server configuration <ul style="list-style-type: none"> - server name, server port number, network interface to use (optional) ▪ connection to new clients ▪ sending user-defined messages to connected clients <ul style="list-style-type: none"> - send to all clients or only to specific clients ▪ receiving user-defined messages from connected clients <ul style="list-style-type: none"> - registration of message handler callback functions for specific messages - polled or asynchronous message delivery ▪ monitoring of client connection statuses <ul style="list-style-type: none"> - queries to determine connected client statuses - notification of new client connections or broken client connections
TimeUtils	<p>Clock access and time conversion services:</p> <ul style="list-style-type: none"> ▪ read system clock time ▪ time conversions between GMT and local time ▪ time conversions to hours, minutes, seconds, day, month, year
SignalRegistry	<p>User-defined signal (interrupt) handler registration services:</p> <ul style="list-style-type: none"> ▪ register a signal handler function for a specified signal <ul style="list-style-type: none"> - invoked when interrupt occurs ▪ unregister a signal handler function for a specified signal

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